

## VACUUM CLEANER APPARATUS WITH A RETRACTABLE HOSE

This invention relates to vacuum cleaner apparatus of the kind including a vacuum cleaner with a suction inlet, a substantially rigid tubular cleaning wand and a flexible hose that can be extended and retracted in length, the hose being connected at one end with the suction inlet, and the other end of the hose being secured with the wand and extending substantially to the forward end of the wand when stowed.

Vacuum cleaners may be of the upright kind where cleaning suction is applied by means of a pump having an inlet directly below the machine. Cylinder vacuum cleaners, by contrast, have an inlet connected to one end of a hose, the other end of which connects to a suction cleaning head. Upright cleaners also usually have provision by which an accessory hose can be connected to the inlet so that a hand-held suction head can be used to clean regions that would otherwise be inaccessible to the machine. The hoses used with vacuum cleaners tend to be bulky so that they have to be stored separately from the cleaner. An alternative hose available on some vacuum cleaners as sold by the major manufacturers has stretch characteristics with a natural, retracted length (when not in use) less than its extended length (when in use). The extended length may be about five times the retracted length. Although this hose has the advantage of being much easier to store than conventional hoses, its resilience may make it more difficult to use in some situations, especially with cylinder vacuum cleaners, which are lighter than upright cleaners.

WO 03/024294 describes a vacuum cleaner hose that can be retracted in length by the application of a vacuum and that can be retained in its retracted length on the vacuum cleaner or in a separate outer container. WO 99/35954 describes a vacuum cleaner where the hose can be retracted into a flexible outer sleeve connected with the vacuum cleaner. EP 1011408 describes a vacuum cleaner hose that can be retracted into the rigid cleaning wand and held by a fitting on the wand that engages grooves on the outside of the hose. US 4050113 describes a vacuum cleaner where the hose is retracted into a tube fixed to the outside of the cleaner. EP 388676 describes an upright vacuum cleaner where a part of the length of an

accessory hose is stored in the cleaning wand clipped onto the cleaner. WO 86/07247 describes another vacuum cleaner hose that can be stored within a cleaning wand.

It is an object of the present invention to provide an alternative hose and vacuum cleaner apparatus including such a hose.

According to one aspect of the present invention there is provided vacuum cleaner apparatus of the above-specified kind, characterised in that a flexible outer member extends externally along a part of the length of the hose and is adapted to be secured between the rear end of the wand and the vacuum cleaner so as to retain the hose in a retracted state within the wand and the outer member.

The hose may be retractable by suction pressure, the wand including an occluder for occluding air flow into the hose. The flexible outer member may be a sleeve. The forward end of the hose is preferably secured adjacent the forward end of the wand. The wand is preferably telescopic having at least two sections slidable one within the other. The outer flexible member may be secured at one end with the vacuum cleaner and have a coupling at its other end that can be coupled with the rear end of the wand.

According to another aspect of the present invention there is provided a hose assembly of a hose, wand and outer flexible member for use in vacuum cleaner apparatus according to the above one aspect of the present invention.

According to a further aspect of the present invention there is provided a method of operating vacuum cleaner apparatus including the steps of applying suction to one end of a flexible hose, using a cleaning head attached to a substantially rigid wand at the opposite end of the hose to clean, subsequently retracting a forward part of the length of the hose relative to the wand and a rear part of the length of the hose relative to a flexible outer member, securing the flexible outer member between the rear end of the wand and the vacuum cleaner so that the hose is retained in a retracted length.

The method may include the step of occluding passage of air into the forward end of the hose while the vacuum cleaner is operating so that suction is created within the hose sufficient to retract the hose in length.

Vacuum cleaner apparatus including a hose according to the present invention, will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a side elevation view of the apparatus during use;

Figure 2 is a side elevation view of one end of the hose and the outer sleeve;  
and

Figure 3 is a partly sectional plan view of the wand retracted for stowage.

The apparatus comprises a cylinder vacuum cleaner 1 and a hose assembly 2 connected at the suction inlet 3 of the cleaner.

The vacuum cleaner 1 may be entirely conventional.

The hose assembly 2 includes a suction cleaning head 20 at its forward end connected to the forward end 22 of a rigid cleaning wand 21. The wand 21 is tubular and telescopic, with two sections 23 and 24, which can be extended in length and locked together for cleaning and can be retracted within one another for storage. At its forward end 22, the wand 21 has a valve or occluder 26. Towards its rear end 27, on the rear section 24, the wand 21 has a handle 28.

The hose assembly 2 also includes a flexible hose 30, which is extensible and retractable in length. In particular, the hose 30 has a natural extended length and can be retracted in length by applying axial pressure to it against its resilience. Typically, the ratio of the retracted to the extended length is between about 1:3 and 1:5. Preferably the hose 30 is of the kind described in WO 03/024294 having a helical support wire and a flexible outer sleeve

that folds outwardly between turns of the wire when the hose is retracted in length. The forward end 31 of the hose 30 is connected with the forward end 22 of the wand 21 and opens into the cleaning head 20. The hose 30 extends rearwardly within the wand 21 and out of its rear end 27. The rear end 32 of the hose 30 has a coupling 33 connected with the suction inlet 3 on the vacuum cleaner 1.

The rear end 32 of the hose 30 extends within a short flexible outer member in the form of a retaining sleeve 40 attached at one end with the coupling 33 on the hose. The sleeve 40 preferably has a fixed length or is only slightly extensible and may have a smooth surface or, as illustrated, be corrugated for improved flexibility. The sleeve 40 has a coupling 41 at its forward end 42.

As shown in Figure 1, the length of the hose 30 is sufficient to provide a flexible section between the rear end 27 of the cleaning wand 21 and the vacuum cleaner 1 to enable the wand to be manoeuvred freely and to provide a useful cleaning radius around the vacuum cleaner. The relatively short length and the flexible nature of the sleeve 40 ensures that this does not substantially impede movement of the wand 21.

When the user has finished cleaning and wishes to stow the hose 30 he closes the occluder 26 while the suction power continues to be created by the vacuum cleaner 1. This produces a reduced pressure within the hose 30 causing an axial pressure to be applied and thereby causing it to retract in length. As the hose 30 retracts, its forward part moves into the wand 21 and its rear part moves into the retaining sleeve 40. This causes the rear end 27 of the wand 21 to come closer to the forward end 42 of the sleeve 40 until the coupling 41 at the forward end of the sleeve can be attached to the rear end of the wand. The sleeve 40 is, therefore, now secured between the rear end 27 of the wand 21 and the vacuum cleaner 1. When this is done, the flexible hose 30 is enclosed along its entire length within the wand 21 and the sleeve 40. The wand 21 can now be shortened by telescoping the two sections 23 and 24 with one another and the wand can be secured to the casing of the vacuum cleaner 1 by a fixing (not shown).

Preferably, the wand 21 extends substantially parallel to the length of the vacuum cleaner 1 and the suction inlet 3 is located towards one end of the cleaner so as to minimize the length of sleeve 40 needed to connect the wand with the suction inlet. The vacuum cleaner 1 can now be turned off, allowing pressure in the hose 30 to return to atmosphere. The hose 30 is held in its retracted state because it is retained by the wand 21 and the sleeve 40. When the vacuum cleaner 1 is to be used again, the user simply unfastens the sleeve 40 from the rear end 27 of the wand 21 and allows the hose 30 to extend. It may be necessary to pull the wand 21 slightly away from the vacuum cleaner 1 to extend the hose 30 fully.

The invention enables a vacuum cleaner hose to be stowed in a very compact configuration, making storage of the apparatus much easier.

The hose assembly could be removed from the vacuum cleaner after use by simply unfastening the coupling with the suction inlet. This enables the hose, within the wand and sleeve to be stored separately of the cleaner, if more convenient.

Instead of its rear end being fixed at the cleaner, the forward end of the sleeve could be fixed with the rear end of the wand and the rear end could have a removable coupling connectible with the cleaner.

The hose assembly is not confined to use with cylinder vacuum cleaners but could be used as an accessory hose assembly with upright cleaners, or with central vacuum cleaner systems. The hose need not be retracted by suction power, it could instead just be pushed into the wand and sleeve manually. The hose could have a normal, retracted state so that a slight pulling force has to be exerted in order to extend it and so that its natural resilience pulls it into the wand and outer member after use.

Instead of the outer sleeve described above, the hose could be retained in its retracted length by some other flexible retainer. The forward end of the hose need not be fixed at the forward end of the wand but could be slidable along its length to its rear end in order to give an increased total usable length, the forward end of the hose sliding to the forward end of the wand for stowage.